Saia-Burgess Controls Ltd

Bahnhofstrasse 18 I CH-3280 Murten I Switzerland

T +41 (0)26 672 71 11 I F +41 (0)26 670 44 43

Provisional documentation, Profibus-DP and Profi-S-IO Contents

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1 Introduction

The new Saia xx7 controllers, which are based on the Saia-NT operating system (PCD2.M487, PCD3.Mxxx7 …) offer various ways of connecting to PROFIBUS-DP and MPI, some of which have to be specially configured, or behave differently from Siemens controllers.

This document describes all the possibilities and serves as a basis for the user guide.

2 Configuration

2.1 Interfaces

A PCD2.M487 has 4 interfaces offering communication via PROFIBUS-DP and/or MPI.

Interface	DP master	Profi-S IO master	DP slave	MPI
PGU RS-232	-	-	-	X
Onboard MPI RS-485	-	X	X	X
F750, Slot B1	X	-	-	X
F750, Slot B2	X	-	-	X

Due to it many possibilities, the MPI interface deserves particular attention and is therefore described in more detail in § 2.4.

Slots B1 and B2 are not present on the PCD3.Mxxx7.

2.2 Possible combinations

2.2.1 Overview

When using different interfaces and protocols at the same time, the following combinations are possible:

Protocol	**DP slave**	**Profi-S-IO master**	**DP master**	**DP master**
Interface	Onboard MPI	Onboard MPI	F750, Slot B1	F750, Slot B2
	-	X	X	-
	-	X	-	X
	X	-	X	
	X	-	-	X
	-	-	X	X

Regardless of these combinations, programming basically remains possible at every interface. However, in the case of an F750 module, it must be configured for that purpose.

Simultaneous communication as DP slave and Profi-S-IO master is not possible via the onboard MPI interface.

2.2.2 Configuration details

All DP configurations are created using the hardware configurator in the SIMATIC Manager. The configuration is then interpreted and applied according to the following criteria:

- Loaded configuration in SDBs

- F750 modules plugged into slots B1 and/or B2

- Value of Profi-S-IO flag in CDB

- Ident number or firmware version of configured CPU

The Profi-S-IO master is configured in exactly the same way as a DP master, although it requires an additional entry in the CDB. All master interfaces can be integrated within the CPU, or configured as CPs.

The following table shows a complete overview of firmware versions for Siemens CPUs, when they are to be configured for the various possible combinations.

No	Number of F750 modules	Profi-S-IO flag	DP slave Onboard MPI	Profi-S-IO master Onboard MPI		DP master F750, Slot B1		DP master F750, Slot B2		Siemens family
			Integral	Integr.	CP	Integr.	CP	Integr.	CP	
1	0	Disable	V1.x	-	-	-	-	-	-	300/400
2		Enable	-	V1.x	-	-	-	-	-	300/400
3		Enable	-	-	V1.x	-	-	-	-	400
4	1	Disable	-	-	-	V1.x	-	-	-	300/400
5		Disable	-	-	-	-	V1.x	-	-	400
6		Disable	-	-	-	-	-	V1.x	-	300/400
7		Disable	-	-	-	-	-	-	V1.x	400
8		Enable	-	V1.x	-	-	V1.x	-	-	400
9		Enable	-	V1.x	-	-	-	-	V1.x	400
10		don't care	V3.0	-	-	-	V3.0	-	-	400
11		don't care	V3.0	-	-	-	-	-	V3.0	400
12	2	Disable[1]	-	-	-	V1.x	-	-	V1.x	400

Important: the following rules apply

- The CPU firmware version is always crucial. The CP version is irrelevant.

- Only the combinations listed above may be configured. All other combinations are not supported and may result in undesirable behaviour.

- Whenever a CP is configured, the corresponding CPU must be configured with firmware V1.x. Combinations 10 and 11 are the only specific exceptions to this rule.

- Only CPs from the 400 series are supported.

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[1] If the Profi-S-IO flag is set to 'Enable' while two F750 modules are plugged in, combination 4 will apply.

- Combinations 8 to 12, which have two DP interfaces configured simultaneously, can only be achieved with CPUs from the 400 series.

- Configuration of a master at the integral interface of a CPU with firmware V3.0 is not supported.

- CPUs with firmware V2.0 are not supported by any combination.

2.2.3 Recommended and tested Siemens CPUs

All Siemens CPUs are listed here that have been tested for the different combinations. Other CPUs may also be possible, as long as they meet the above criteria.

Combination 1: DP slave on onboard MPI

CPU 315-2 DP	315-2AF03-0AB0	
CPU 316-2 DP	316-2AG00-0AB0	V1.0, V1.1, V1.2
CPU 318-2 DP	318-2AJ00-0AB0	

Combinations 2, 3, 4, 5, 6 and 7: Profi-S-IO or DP master as integral or CP interface

Integral interface:

CPU 414-2 DP	414-2XG03-0AB0	V1.1, V1.2
CPU 315-2 DP	315-2AF03-0AB0	
CPU 316-2 DP	316-2AG00-0AB0	V1.0, V1.1, V1.2
CPU 318-2 DP	318-2AJ00-0AB0	

CP:

CP 443-5	443-5DX02-0XE0	V 2.0

Combinations 8, 9 and 12: two simultaneous masters

Integral interface:

CPU 414-2 DP	414-2XG03-0AB0	V1.1, V1.2

CP:

CP 443-5	443-5DX02-0XE0	V 2.0

Combinations 10 and 11: simultaneous DP slave and DP master

In this combination, "DP Mode" must always be set to "S7 compatible"!

Slave (integral interface):

In this combination, selection of a CPU with firmware V3.0 is mandatory. The only CPUs supported are those listed here.

CPU 412-2 DP	412-2XG00-0AB0	
CPU 414-2 DP	414-2XG03-0AB0	V3.0
CPU 416-3 DP	416-3XL00-0AB0	

Master (CP):

CP 443-5	443-5DX02-0XE0	V 3.0

2.3 DP master at F750

The DP master can be configured as standard.

2.4 Onboard MPI interface

2.4.1 Overview

The onboard MPI interface offers the following communications possibilities:

No.	Profi-S-IO master	DP slave	MPI
1	-	-	X
2	-	X	X
3	X	-	X

This interface is special because a single physical interface supports several protocols. They have to be configured in different places within the Siemens hardware configurator, because the corresponding Siemens CPUs provide a separate physical interface for each protocol.

For this reason, the following points should be noted when **configuring a DP slave or Profi-S-IO master**:

- The master/slave **address** must be the same as the MPI address. All other bus parameters (baud rate, HSA, timing) are taken from the DP configuration, regardless of the MPI parameters configured.

- The entire bus parameters for a valid DP configuration are stored in EEPROM, just like the MPI parameters. Parameters saved will remain here, even after a primary delete and power-on. They will only be overwritten when a new MPI configuration (without DP configuration) is loaded.

2.4.2 Baud rates supported

The onboard interface supports the following baud rates:

93.75 kBaud, 187.5 kBaud, 500 kBaud, 1.5 MBaud

If an unsupported baud rate is configured, two alternative scenarios are possible:

1. If the configuration applies to the MPI only, the default baudrate of 187.5 kBaud will be set automatically.

2. If a DP configuration contains an invalid baud rate, the last valid bus configuration will remain active.

2.4.3 DP slave

The actual slave configuration should be implemented in the standard way. Make sure that MS mode (master-slave) is selected for each I/O declaration line.

2.4.4 Profi-S-IO master

Profi-S-IO master is configured exactly like DP master.

An additional **entry in the CDB** is needed to specify that the master configuration is not intended for an F750 interface, but for the onboard Profi-S-IO master. This entry is defined as follows:

‚Profi-S-IO:Enable'

This entry must be in the CDB before the Profi-S-IO master can be activated.

3 Behaviour

3.1 General

3.1.1 STOP-RUN

Every DP configuration that is loaded will only be activated by a STOP-RUN transition. Equally, when a DP configuration is deleted (or new MPI configuration loaded), this change will only be implemented at the next STOP-RUN transition.

If a STOP-RUN transition is executed in the absence of any change to the configuration, the relevant interfaces will continue to run without interruption.

3.1.2 Power-on

Interfaces are not initialized by a power-on. This only happens with a STOP-RUN transition.

3.2 MPI interface

3.2.1 Reconfigure

When the parameters of the MPI interface are changed, they will normally become active directly after loading. However, this does not apply in the following situations:

- When another MPI connection remains active (e.g. monitor variables)

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- When there is an active DP configuration and then a new MPI configuration is loaded, without a DP configuration. In this case, the MPI parameters will only become active at the STOP-RUN transition.

In some circumstances, the following situation can lead to undesirable behaviour on the bus:

- When an MPI configuration is active (i.e. not master/slave) and a new configuration is loaded with modified (!) MPI parameters and an additional DP configuration, the interface will be reinitialized twice: directly after loading the modified MPI parameters and at the next STOP-RUN transition for the DP parameters.

3.2.2 Clear/Reset

The Clear/Rest functionality will delete the master or slave configuration. However, the corresponding bus parameters (address, baud rate, profile) will not be deleted and will remain active.

3.2.3 Power-on

After a power-on, the MPI interface will be initialized with the last valid bus parameters (address, baud rate, profile), regardless of whether they come from an MPI or DP configuration.

3.2.4 FW download

After a firmware download, the last valid bus parameters (address, baud rate, profile) will remain active.

3.3 Plug-Ins

When the DB containing a plug-in has been downloaded to the master controller, it is necessary to execute a power-on, so that the file is recognized.

4 MPI communication with different partners

4.1 Programming

4.1.1 MPI interface

If a DP slave or Profi-S-IO master is configured on the MPI interface, it will still be possible to program via this interface.

This will require setting the PG/PC interface to **PC Adapter (PROFIBUS)** in the SIMATIC Manager, and setting Properties with the same configuration as selected for the slave/master in the bus parameters.

4.1.2 Serial interface

For programming via the serial RS-232 interface, the PG/PC interface must always be set to **PC Adapter (MPI)** in the SIMATIC Manager.

4.2 MPI and DP/Profi-S-IO at same interface simultaneously

4.2.1 General

The onboard MPI interface allows communication across MPI while a DP slave or Profi-S-IO master is active at the same time. Since the DP parameters are always used for bus configuration when a slave or master is active, it is particularly important to ensure that the MPI communications partner is using the correct bus parameters. These must be the same parameters as in the DP configuration, and not those of the standard MPI interface, which would normally be used.

4.2.2 MPI terminal

Since bus parameters cannot, as a rule, be set for an MPI terminal, this situation calls for selection of a DP configuration with bus parameters that match those of the MPI terminal.

To run an ESA MPI terminal simultaneously with DP, the following bus parameters must be selected in the DP configuration:

  Baud rate: 187.5 kBaud

  Profile: Universal; or DP profile and slot time = set 150 bits

This has been tested with an ESA VT50.

4.2.3 MPI communication with controllers of the older PCD2.M1x7 series

To communicate across the MPI with a PCD2.M1x7 series controller when there is a simultaneous DP/Profi-S-IO configuration, the following parameters must be selected in the DP/Profi-SIO configuration:

  Baude rate: 187.5 kBaud

  Profile: Universal

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5 Troubleshooting

5.1 Check list

If errors occur, check the following points first:

- Is the Profi-S-IO flag set (or not set) correctly?

- Is the address of the DP slave or Profi-S-IO master the same as the MPI address?

- Does the firmware version of the selected CPU satisfy the rules set out in § 2.2.2

- Have all F750 modules inserted also been configured?

- Have all the rules set out in § 2.2.2 been followed?

- Is the configured baud rate supported by the onboard MPI interface, as described in § 2.4.1?

5.2 Special cases

If an invalid or inconsistent configuration is loaded that does not meet requirements, the controller will, as a rule, switch to the STOP state. The message: **Stopped by peripherals management** will be entered in the diagnostic buffer.

In a few exceptional cases, however, a configuration may not even be recognized as such, or else it may be wrongly interpreted and activated.

5.2.1 Master configuration with just one slave

If the slave has the same address as the controller's MPI address, the configuration will be interpreted as a slave configuration and the controller started without error message.

Eliminate error by setting the Profi-S-IO flag, or plugging a F750 module.

5.2.2 Master configuration with several slaves

The configuration is not recognized and the controller starts without an error message.

Eliminate error by setting the Profi-S-IO flag, or plugging a F750 module.

6 SFCs for DP functionalities

Three SFCs offer functions associated with PROFIBUS-DP and have been implemented on Saia controllers with maximum compatibility. Implementation ist basically the same as for the F750 module and the Profi-S-IO master.

6.1 SFC11: Synchronize groups of DP slaves

SFC11 can be used to transfer Sync and Freeze commands to slaves.

The Profi-S-IO master does not currently support this functionality.

6.2 SFC12: Deactivate and activate DP slaves

SFC12 can be used to deactivate and then reactivate configured slaves.

The following functionalities are supported with **Siemens compatibility**:

- Basically all parameters: REQ, MODE, LADDR, RET_VAL and BUSY

- When a DP slave is deactivated with SFC 12, its process outputs will be set to the projected default values or to 0 (secure state).

- When a DP slave is deactivated with SFC 12, the DP master will not subsequently respond to that DP slave.

- When a DP slave is reactivated with SFC 12, it will be configured and its parameters set by the appropriate DP master (as for the return of a DP station after failure).

- Deactivated slaves will be automatically reactivated after a power-on.

- A STOP-RUN transition will leave the activation status of slaves unchanged: activated slaves remain activated, deactivated slaves remain deactivated.

The following functionalities are **NOT supported**:

- If your program directly accesses the effective data of a previously deactivated DP slave, the peripheral access error OB (OB 122) will be called and the appropriate start event will be entered in the diagnostic buffer. If you access a deactivated DP slave via an SFC (e.g. SFC 59 RD_REC), you will receive the same error information in RET_VAL as for an unavailable DP slave.

  ➢ OB 122 is not called and no event is entered in the diagnostic buffer.

- If you try to use SFC 12 to reactivate a deactivated slave that is physically separate from the DP bus, the LED "DP-BUSF" on the CPU will flash for about one minute. After this monitoring time has elapsed, the SFC will return error code W#16#80A2, the LED will go off, and the slave will remain deactivated. If at a later time its connection to the DP bus is restored, you must reactivate the slave with SFC 12.

  ➢ The slave is immediately activated, even if it is not connected to the bus, and the SFC does not return an error code. As soon as the slave is reconnected to the bus, the connection is established and data exchanged.

- If you want to cancel a current activation job, start SFC 12 with the same value for LADDR and MODE = 2. Keep calling SFC 12 with MODE = 2 until the successful cancellation of the activation job is displayed with RET_VAL = 0.

  ➢ An activation job cannot be cancelled.

6.3 SFC13: Read diagnostic data of a DP slave (slave diagnosis)

SFC13 can be used to read the diagnostic data of a DP slave.